Deviation Firmware for Devo7e/10 User's Manual

Version 3.0

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Overview

Deviation is a replacement firmware for the Devention™ series (Devo) transmitters. The primary goal is to add support for multiple protocols, opening the full potential of this platform.
The core of the Deviation firmware is the mixer system, which is modeled after the system used in the Er9X firmware for the Turnigy/Flysky9x™ transmitters.

Deviation also brings a USB file-system support, making it easy to manage the transmitter from any PC without the need for specialized upload/download tools.

Deviation has been designed for ultimate configurability. All model and transmitter configuration is controlled through text files which the firmware (or user) can read and write. It is easy to know exactly what is configured, as well as to modify the configuration either through the transmitter or with a text editor. The main screen is very configurable; any mix of inputs, switches, channel data, or timers can be displayed, and configured per-model. Deviation also supports customizable themes with full control over the images, fonts, and colors.

Deviation can store up to 255 different models, and uses a portable syntax that allows sharing models between any transmitter supported by Deviation.

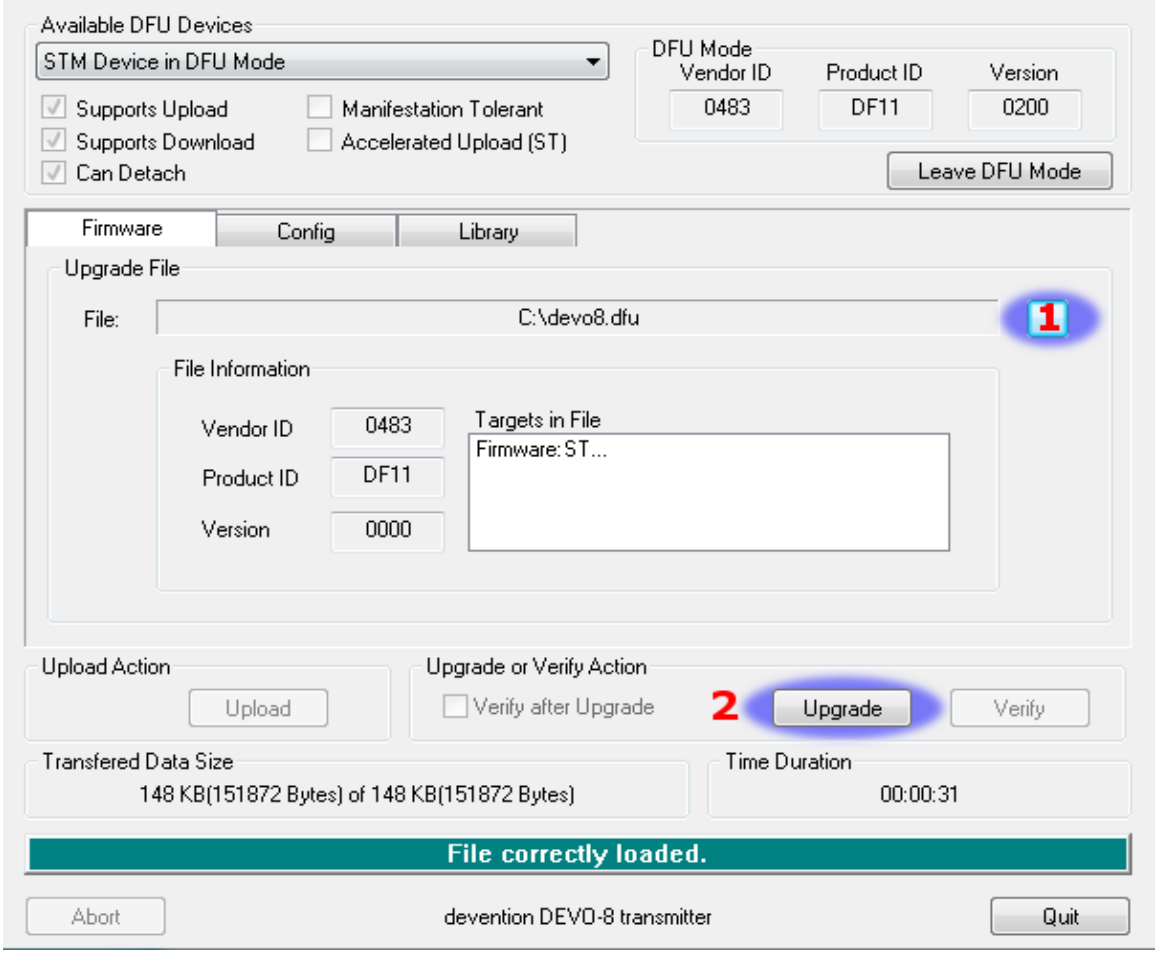
Deviation has been internationalized. New language support can be added by simply copying a translation file into the appropriate directory on the transmitter (NOTE: Deviation on the Devo7e currently only supports the English language).

Installation

Installation of Deviation is done just like upgrading the Walkera firmware.
Note that Deviation will NOT overwrite Walkera models stored on the Tx. While they cannot be accessed by Deviation, they will be safely preserved should the Walkera firmware ever need to be reinstalled (Note: With the Devo7e firmware, the original models will be lost when switching to Deviation).

First install the deviation-devoXX-x.y.z.zip firmware using the Walkera 'DfuSe USB Upgrade' tool. You will need the 'Devention DfuSe USB Upgrade Tool' from Walkera: http://www.walkera.com/en/upload/upgrade/2013-2-26.rar. **Do NOT attempt to use the DfuSe tool from STMicroelectronics!** It is recommended to test that this tool works by upgrading to a different Walkera firmware. Several users have had compatibility issues with the DfuSe tool.

Plug the transmitter into the PC via USB, and turn on the transmitter while holding 'EXT' to enter programming mode.



1) Press the '...' button and select the dfu file to install
2) Select 'Upgrade' to install the firmware. This will be grayed-out if your Tx is not detected. **Do NOT use 'Upload' as this will destroy the dfu file on your PC.**

There have been reports of it corrupting the model settings on the TX as well.

3) Devo7e owners only: copy 'protocol' directory to the transmitter (see below)

Turn off the transmitter, and turn back on while holding 'ENT'. There should be a USB logo on the screen.

If this is a first-time install of Deviation, the PC should prompt to format the drive. Format using default options. Next unzip the deviation-fs-devoXX-x.y.z.zip to the Tx USB drive.

If this is an upgrade from a previous Deviation release, it is strongly recommended to back-up the 'models' directory from the transmitter as well as the tx.ini file to ensure you don't lose any model or transmitter configuration. Next unzip the deviation-fs-devoXX-x.y.z.zip to the PC and copy all directories EXCEPT for the 'models' directory and the tx.ini file to the transmitter. Optionally, copy the 'models' directory to the transmitter except for the currently configured model files. This last step will ensure that the defaults for newly created models have the latest options set. If the tx.ini file is overwritten, the stick calibration must be repeated and any settings reset.

For Devo7e users, there is an additional step that needs to be completed every-time after installing the firmware. The firmware also includes a set of '.mod' files in the protocol directory. The entire protocol directory must be copied to the transmitter. **This must be done each time the firmware is upgraded, otherwise the firmware will not work properly.**

USB & File-system

Deviation stores all configuration, bitmaps, and models as regular files on the USB file-system.
USB can be most easily enabled by holding down the 'ENT' button while powering up the transmitter. Files can then be easily copied to or from the Tx.

The directory structure is as follows:

\tx.ini	Transmitter config. Includes trim settings, calibration data, and the last-used model number
\errors.txt	If the firmware crashes or reboots, debug information will be stored in this
\media\config.ini	The color scheme and fonts for the transmitter
\media\sound.ini	Contains notes to play for various alarms
\media*.bmp	Images used for the current Tx theme
\media*.fon	Font files
\models\default.ini	The default model, loaded whenever a model is cleared
\models\model*.ini	Configuration files for each model. Due to a limitation in the firmware, Deviation cannot create new files. It is therefore necessary to have a modelxx.ini for each model regardless of whether it is currently in use.
\modelico*.bmp	All available model icons (must be 96x96 pixels)
\templates*.ini	Configuration files used when loading predefined templates. These are nearly identical to the model configuration files, however they do not necessarily define all parameters
\language\lang*.*	Language translation files. These are UTF-8 text files containing the English string and the respective translated string. (Changing lnguage is not supported on the Devo7e)
\protocol*.mod	(Devo7e only) These contain the protocol files. They must be re-installed with each firmware upgrade

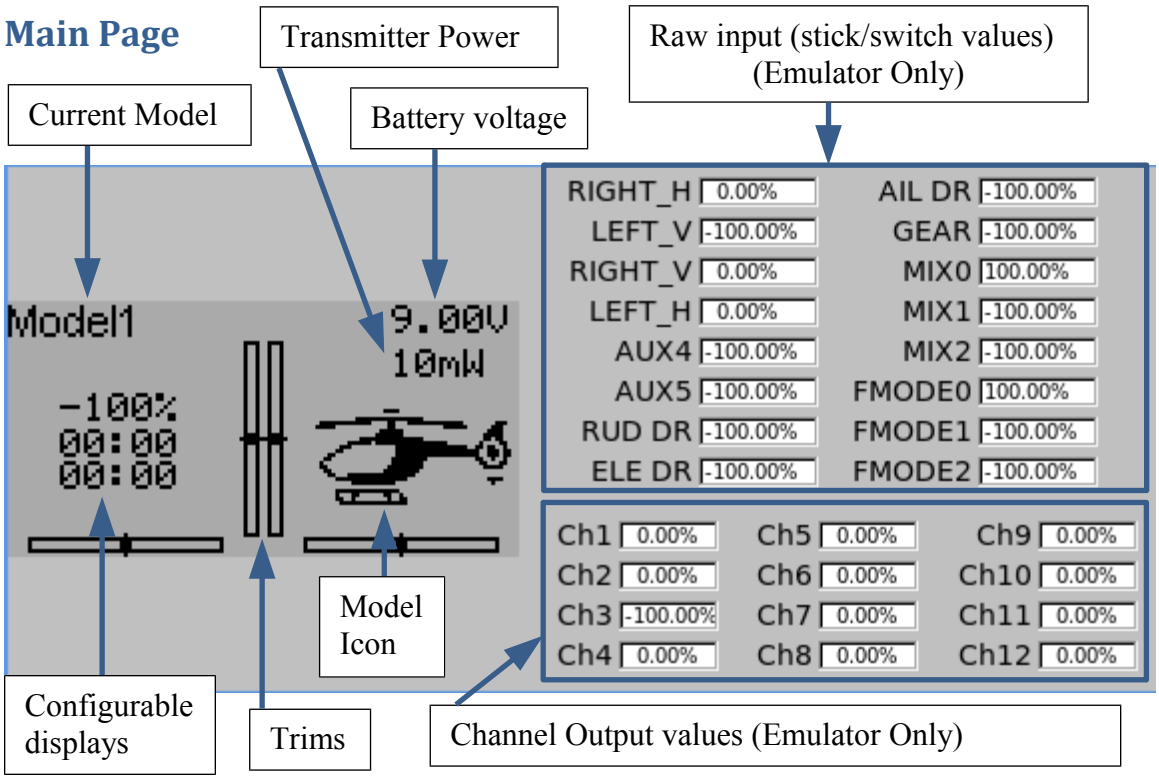
Reporting Bugs

To report bugs with the Deviation firmware, file a ticket at:
https://bitbucket.org/PhracturedBlue/deviation/issues

It is recommended that you create an account in order to be informed of updates to the ticket, but this is not required.
Please include the Deviation version in all reports (find this on the USB/Version page)
If the bug includes a crash or reboot of the firmware, additionally include:

- The '.elf' files that came with the firmware zip file.
- The errors.txt file from the transmitter

Main Page



Current Model: The name of the current model. It is configured from the Model Configuration page.

Transmitter Power: This indicates the currently selected transmitter power. It is configured from the Model Configuration page.

Battery Voltage: Numerical representation of current Tx battery state

Configurable Displays: These can be text-boxes contacting input, channel, telemetry, or timer data; bar graphs displaying channel data; or icons displaying specific states (e.g. gear, flaps,…)

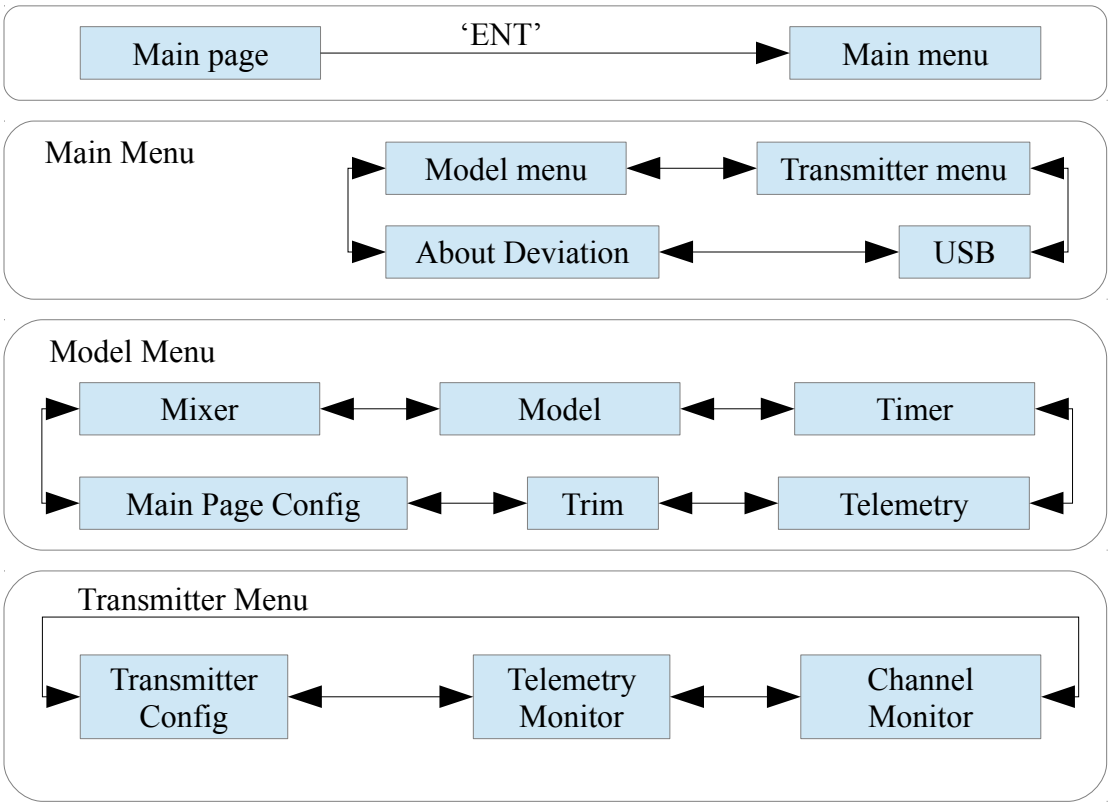
Model Icon: An image representing the current model. It is configured from the Model Configuration page.

Trims: The trim display can be configured to show 0, 4 or 6 trims

Navigating

The transmitter menus can be navigated via the physical buttons (Up, Down, Left, Right, Ent, Ext).
The Menu is entered by pressing 'ENT' on the main menu
There are two types of spin-boxes available. Those consisting of both arrows and an oval may act both as spin-boxes (for selecting a value) and as a button (which can have various effects). Spin-boxes that contain only arrows and no oval do not act as buttons, and are only used for value selection
On all menu pages, 'UP' and 'DN' are used to navigate to the previous/next item.
The 'R+' and 'L-' buttons are used on spin-box widgets to increase or decrease the selected value. In some cases holding down the button will use larger step values to move more quickly to the desired value.
For Buttons and rounded-spin-boxes, pressing ENT' will press the button
Pressing 'EXT' will exit 1 menu level.

Menu Layout



Emulator

The emulator provides a side-screen displaying the current virtual-stick/switch states as well as the Channel output that would be received by the servos
The emulator controls are as follows (based an an English keyboard):

Button	Action
q/a	Left-Vertical stick (Throttle in mode 2)
Q/A	Left-Vertical trim
w/s	Left-Horizontal stick (Rudder in mode 2)
W/S	Left-Horizontal trim
e/d	Right-Vertical stick (Elevator in mode 2)
E/D	Right-Vertical trim
r/f	Right-Horizontal stick (Aileron in mode 2)
R/F	Right-Horizontal trim
z	Gear
x	Rudder Dual-Rate switch
c	Elevator Dual-Rate switch
v	Aileron Dual-Rate switch
b	Mix 0/1/2 switch
n	FMode 0/1/2 switch
\	Power off
Left-arrow	Left
Right-arrow	Right
Up-arrow	Up
Down-arrow	Down
Enter	Ent
Escape	Exit

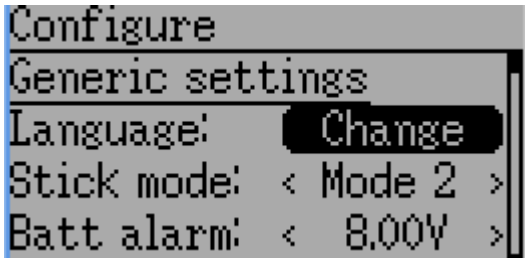
About Deviation Page

The Deviation release version can be accessed by selecting ‘About Deviation’ from the main menu.

USB Page

The USB page cab be accessed by selecting ‘USB’ from the main menu. USB mode can then be toggled on/off to enable access to the transmitter’s file-system. **Note that doing so should never be done while the model is bound, as USB will disrupt signal transmission!**

Transmitter Configuration Page



The Configuration page defines various transmitter functions. It is entered from the main menu via 'Transmitter Menu' followed by 'Transmitter Config'.

General Settings

Language: Select an appropriate language for all text (Not available on Devo7e)
Stick mode: Select one of Mode 1-4.

- Mode 1 is common in Europe. Elevator and Rudder on left, Throttle and Aileron on right.
- Mode 2 is common in North America. Throttle and Rudder on left, Elevator and Aileron on right.
- Mode 3 has Elevator and Aileron on left, Throttle and Rudder on right
- Mode 4 has Throttle and Aileron on left, Elevator and Rudder on right

Sticks: Calibrate the range of all analog sticks and dials

Buzz Settings

Buzz volume: Set buzzer volume
Vibration: Turn haptic feedback on/off
Batt alarm: Set battery voltage at which alarm will sound
Alarm intvl: Set frequency of alarm when battery is low.
PwrDn alert: Play sound at power-down

LCD Settings

Backlight: Set screen brightness
Contrast: Set screen contrast
Dimmer time: Set delay before screen dims
Dimmer target: Set screen brightness when dimmed

Timer Settings

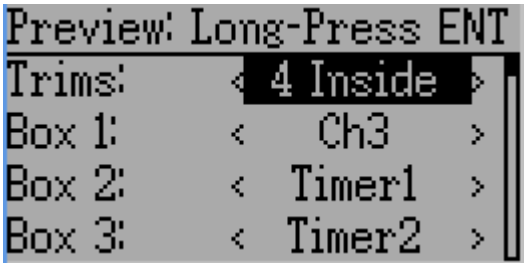
Prealert time: Time before timer reaches zero to start beeping
Prealert intvl: How often to beep before timer reaches zero
Timeup intvl: How often to beep once timer has expired

Telemetry Settings

Temperature: Set units to display temperature for telemetry
Length: Set units to display length for telemetry

Main Page Configuration (Standard & Advanced GUI)

The Main Page Configuration page provides customized control of the main-page layout. The display of boxes, bars, icons, and trims along with their contents can all be controlled from here. This page is accessed from the main-menu via 'Model menu' followed by 'Main page config'.



Preview

Entering preview by a long 'ENT' press will allow quickly visualizing any changes made via the configuration page. Press 'EXT' to return to the configuration.

Trim Positions

There are 4 options for the Trim Positions:

- None: No trim bars are shown
- 4 outside: Only 4 trims are shown, and they will be placed at the screen edges
- 4 inside: Only 4 trims are shown, and they are placed at the middle of the screen
- 6 Trims: 6 trims are shown, all placed towards the inside

Boxes

Boxes are used to display interesting text values. There are 8 available boxes. Boxes 1 through 4 are drawn on the left, and boxes 5 through 8 are drawn on the right. Currently a box can display one of the timers, one of the output channels, or telemetry data.

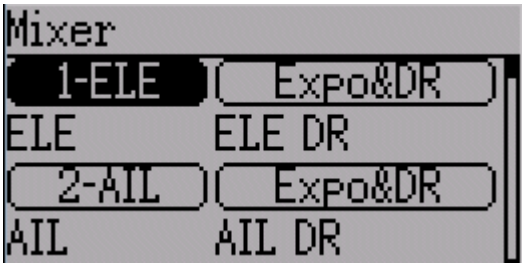
Switch Display

Switches are used to display the state of an input or output channel. A switch is either on (value > 0) or off (value <= 0). Up to 4 switches can be displayed. When a switch is enabled, a small indicator box will be displayed on the main page corresponding to the appropriate switch.

Quick-page Selection

Quick-pages allow quick access to other pages from the main page via Long-UP or LONG-DN buttons. Up to four quick-pages can be configured.

Mixer (Advanced GUI)

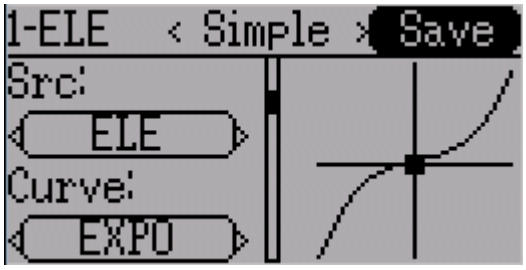


The Mixer page controls how inputs (sticks/switches) are assigned to output channels. The mixer page is accessed from the main menu via 'Model menu' followed by 'Mixer'.

The Deviation mixer is modeled after the Er9x implementation. Each output channel is composed of a series of one or more mixers each of which consists of a single input, an activation switch, and a function/curve that modifies the mixer output. This is a very powerful capability, but it is requires a lot of understanding to make full use of. In order to simplify implementation, there are 3 templates that have been defined to make defining channels easier.

The number of channels available is dependent on the number of channels selected on the Model Setup Page (Standard & Advanced GUI). Additionally there are 10 Virtual channels that can be used as an intermediate step for complex setups.

Simple Template



The simple template is the simplest manner of defining a channel. It allows defining a primary-input (stick, switch, or other channel), and applying a curve or function to that input. The result can also be scaled or have an alternate zero-offset.

A 'Long-ENT' press will update the current mixer settings, making it possible to test them on the transmitter.

Src: The input source controlling this mixer
Curve: The function applied to the input to generate the output. See the Curve section for more info. Selecting the 'Curve' spin-box will allow configuring the Curve in the case that a multi-point curve or Expo-rate are chosen.
Scale: A multiplicative scalar that is applied after the Curve to control the output range
Offset: an additive offset that is applied after the scaling.

Expo & Dual-Rate Template

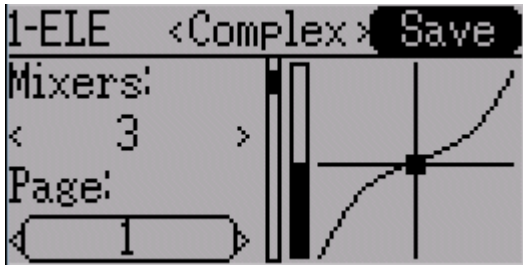
The Expo/Dual-Rate template is a more sophisticated template designed to allow use of toggle or 3-way switches to manipulate an input. The primary-input (stick, switch, or other channel), can have a different curve/function and scaling for each toggle-switch position.

Selecting a value for Switch1 or Switch2 will activate the corresponding section. Each section can either have a 'linked' curve (curve is the same as the 'High-Rate' curve) in which case only the scalar can be modified, or alternatively can have an independent curve definition. Pressing the 'Mid-Rate' or 'Low-Rate' button for a given switch will toggle between linked and independent curves.

A ‘Long-ENT’ press will update the current mixer settings, making it possible to test them on the transmitter.

Src: The input source controlling this mixer
Curve: The function applied to the input to generate the output. See the Curve section for more info. Selecting the ‘Curve’ spin-box will allow configuring the Curve in the case that a multi-point curve or Expo-rate are chosen.
Switch: Specify a switch to enable Medium or Low rates.
Scale: A multiplicative scalar that is applied after the Curve to control the output range

Complex Template



The Complex template unlocks the full power of the mixer system. For a given channel, any number of mixers can be applied to affect the final result. Each mixer is applied based on whether the specified switch is active, and can either replace, add to, or multiply to the previous mixers for this channel. Using this system it should be possible to define an output channel as a combination of any number of inputs.

A ‘Long-ENT’ press will update the current mixer settings, making it possible to test them on the transmitter.

The Complex Mixer page has the following options:
Mixers: Specify the number of mixers for this channel
Page: Specify the current mixer page being edited. Pressing the spin-box will allow reordering the pages of the current channel.
Switch: Specify an optional switch which determines whether the current mixer is active.
Mux: Defines how the current mixer is applied to the previously defined mixers for this channel. Options are:

- **Replace**: If this mixer is active, all previous mixers are ignored
- **Add**: Add the value of this mixer to the previous mixers
- **Mult**: Multiply the value of this mixer with the previous mixers
- **Max**: The output will be the greater of the current mixer vs the previous mixers
- **Min**: The output will be the lesser of the current mixer vs the previous mixers

Src: The input source controlling this mixer
Curve: The function applied to the input to generate the output. See the Curve section for more info. Selecting the ‘Curve’ spin-box will allow configuring the Curve in the case that a multi-point curve or Expo-rate are chosen.
Scale: A multiplicative scalar that is applied after the Curve to control the output range
Offset: an additive offset that is applied after the scaling.

Trim: Selects whether or not any trims for the selected Source are applied to this mixer

Note that while the scale value is limited to 100%, the mixer may provide a value larger than 100% if an offset is set or if the trim value is non-zero.

A given mixer can be considered to have the general form:
M(x) = if(*Switch*) { *Src* * *Curve* * *Scale* + *Offset*} else {0} + *Trim*

The combination of mixers for a given output channel is defined by the Mux type:

For a 'Replace' mux:
C_x = if($Switch_n$) {M_n} else if ($Switch_{n-1}$) {M_{n-1}} … else if ($Switch_0$) {M_0}

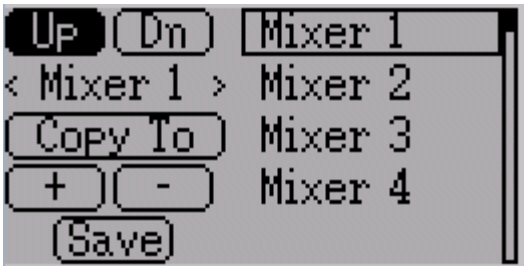
For a 'Multiply' mux:
C_x = if($Switch_n$) {M_n} else {1} * if ($Switch_{n-1}$) {M_{n-1}} else {1} * … *
if ($Switch_0$) { M_0} else {1}

For an 'Add' mux:
C_x = if($Switch_n$) {M_n} else {0} + if ($Switch_{n-1}$) {M_{n-1}} else {0} + … +
if ($Switch_0$) { M_0} else {0}

For a 'Max' mux:
C_x = MAX(if($Switch_n$) {M_n} else {0}, if ($Switch_{n-1}$) {M_{n-1}} else {0}, …,
if ($Switch_0$) { M_0} else {0})

For a 'Min' mux:
C_x = MIN(if($Switch_n$) {M_n} else {0}, if ($Switch_{n-1}$) {M_{n-1}} else {0}, …,
if ($Switch_0$) { M_0} else {0})

Reordering Mixers



Since the ordering of mixers is important to the output, it is possible to reorder and/or copy mixers in order to facilitate building complex rules. This page is accessed by pressing the 'Page' spin-box on the complex mixer page.

Select the respective mixer and use the up/down buttons to move the order of the selected mixer. Note that the mixer name represents its position when the reorder dialog was opened. If the dialog is closed and reopened, all mixers will be shown as numbered sequentially.

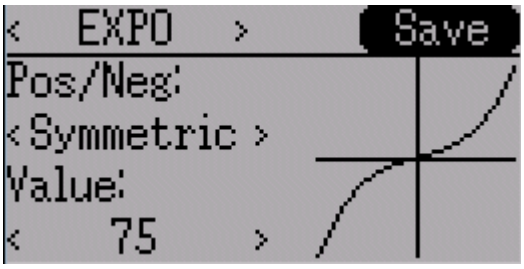
The reorder page can add new mixers or delete existing ones using the '+' and '-' buttons respectively. A mixer can also be copied to an existing mixer (overwriting it in the process) by using the 'Copy To' functionality

Available Curves

The following curve functions are supported:
1-to-1: Output is equal to the input (not editable).
Fixed: Output is constant regardless of input (not editable).
Min/Max: Output is -100 if input is < 0 and 100 if input is >= 0 (not editable)
Zero/Max: Output is 0 if input is < 0 and 100 if input is >= 0 (not editable)
>0: Output is 0 if input is < 0 and matches the input when >= 0 (not editable)
<0: Output matches the input when < 0 and is 0 if input >= 0 (not editable)
ABSVAL: Output is the absolute-value of the input (not editable)
EXPO: Apply exponential curve to the input for non-linear response (editable)
Deadband: Output will not respond to input values near zero (editable)
Multi-point: Curve is based on 3 to 13user-defined points

Curve Editing

The Curve Editor is accessed by pressing a graph or by pressing the curve spin-box when it is selectable. Some curve types may not be edited (any of the curves preceding the 'Expo' curve), and the curve-box will not be selectable if one of these curves is currently active.



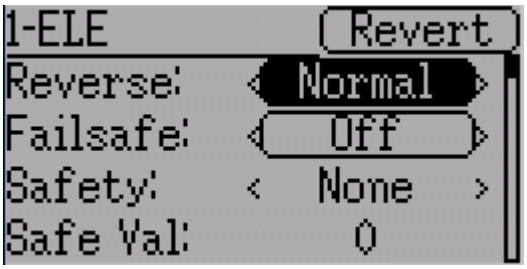
The Curve editor page will be difference depending on which curve is selected. It is not possible to change the curve type from the curve editor (except when a multi-point curve is selected)

For the Expo curve, the controls allow independently configuring the shape of the curve for values greater-than or less-than zero.

For the Deadband curve, the controls allow independently configuring the deadband width for values greater-than or less-than zero.

For the Multi-point curves, Each point can be individually set. Points are set by choosing the point number and then choosing a value. Touching the graph will allow quickly setting the value to the touched y-coordinate.

Channel configuration



The Channel configuration provides the ability to configure the final channel outputs. Capabilities such as channel reverse and fail-safe values are applied here. Also available are controls for end-points, scaling, sub-trim, and a safety switch (which could be used to ensure that a motor cannot spin-up while working on a model)

Changes to this page will immediately effect the channel output. Pressing 'Revert' will restore the shown values to their saved state.

Reverse: Reverse the direction of servo rotation

Failsafe: Specifies a value that the Rx should use when it loses signal from the transmitter. Not all receivers support this capability.

Safety: Specifies a switch that will override all mixers and force the channel output to 'Safe Val' when flipped.

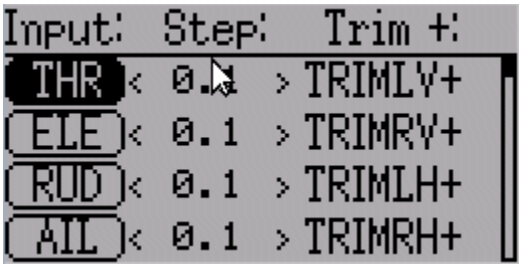
Min Limit/Max Limit: These values define the minimum and maximum values that the transmitter will ever send to the receiver (after all scaling and trims are applied). If a calculated value is outside the min/max range, it will be clipped to either the min or max value as appropriate.

Scale+/Scale-: These values define a final scalar to adjust the servo throw.

Sub-trim: Adjust servo zero position

Speed: Adjust maximum servo speed. Zero is disabled (fastest), 1 is slowest, 100 is fastest rate.

Trims and Virtual Inputs (Standard & Advanced GUI)



The trim page allows assigning the trim buttons and trim step, as well as configuring buttons to work as virtual inputs. It s accessed from the main menu via 'Model menu' followed by 'Trims'.

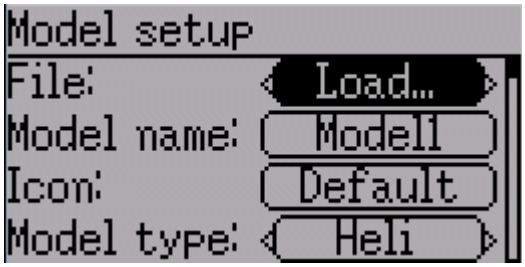
If the 'Input' field is set to an input stick, then the trim is applied as part of the mixer, and will operate as a typical trim control. If the 'Input' field is set as a channel or virtual-channel output, the value is applied directly to the channel output. In this case, the

selected ‘Pos’ and ‘Neg’ buttons can operate as a virtual stick to control an output channel.

The Trim-step defines how sensitive the trims are to input. The maximum number of trim steps is +/-100. So a step size of 0.1 will allow a full +/- 10% of trim adjustment on the servo.

Model Setup Page (Standard & Advanced GUI)

The model page provides various model configuration options. It s accessed from the main menu via 'Model menu' followed by 'Model setup'.



File: The File spin-box allows loading a new model, copying the existing model to a new location, resetting the current model to the default (all configuration is lost), and loading templates (see Predefined Templates)
Model Name: Set the model’s name
Icon: Choose the model’s icon
Model Type: Set the model type. Some models (e.g. helicopter) have additional configuration options that can be accessed by clicking the Model type.
Protocol: Set the type of Rx being used. Note that some protocols have additional options that can be accessed by pressing the Protocol spin-box when it is active. See the Protocol section for more on specific protocols. Note that a protocol change will take effect immediately and could cause a bound model to behave erratically.
Number of channels: Sets the number of channels to transmit (the maximum number of channels is dependent on the selected protocol).
Tx Power: Specify the radio output power when applicable.
Fixed ID: The Fixed ID sets a unique code to ensure that the Tx will only bind to a specific model. This is useful to ensure that the Tx is not accidentally bound to the wrong model.
Bind/Re-Init: Depending on the protocol and Fixed-ID setting, the Tx may bind with the model on start-up, or may need to be manually bound once. See the Protocol section for more on specific protocols. If the protocol does not support binding, the button will show ‘Re-Init’, which can be used to switch protocols without power-cycling the transmitter.
Mixer GUI: Defines which GUI to use for this model. The ‘Advanced’ GUI is the default for Deviation. The ‘Standard’ GUI is only available for Helicopter models and more closely resembles a traditional vendor GUI.

Protocols

Some protocols have additional customization or limits. Each of the protocols is described below. If an ‘*’ is shown before the protocol name, it means this protocol is not currently supported by the transmitter. This generally means that the necessary hardware module is not installed or has not been configured properly. More information

can be found in the Module installation guide:
http://www.deviationtx.com/repository/Documentation/ModuleInstallation.pdf/

Protocol: DEVO

The DEVO protocol is used to maintain compatibility with the Walkera DEVO receivers/models. This protocol supports up to 12 channels. The DEVO protocol supports both auto-binding and manual-binding. If FixedID is set to 'None' the transmitter will attempt to auto-bind with the receiver every time it is powered n. If a value is set for FixedID, the receiver must be bound manually one-time using the 'Bind' button, after which it should stay bound. Note that the FixedID is only part of the binding procedure. Two transmitters with the Same ID cannot control the same model.

The DEVO protocol also supports enabling/disabling the telemetry capability. This option is accessed by pressing the Protocol spin-box when DEVO is shown.

Protocol: WK2801

The WK2801 protocol is used to control older Walkera models. The previous Walkera models were segmented into 3 similar but not identical protocols: WK2801, WK2601, WK2401. This roughly corresponds to the number of channels supported, but many of the newer 6-channel receivers actually support the WK2801 protocol. It is recommended to try the WK2801 protocol 1st when working with older Walkera models before attempting the WK2601 or WK2401 mode, as the WK2801 is a superior protocol. The WK2801 protocol supports up to 8 channels, and both auto-binding and manual-binding. If FixedID is set to 'None' the transmitter will attempt to auto-bind with the receiver every time it is powered on. If a value is set for FixedID, the receiver must be bound manually one-time using the 'Bind' button, after which it should stay bound.

Protocol: WK2601

The WK2601 protocol is used to control older Walkera models. The previous Walkera models were segmented into 3 similar but not identical protocols: WK2801, WK2601, WK2401. This roughly corresponds to the number of channels supported, but many of the newer 6-channel receivers actually support the WK2801 protocol. It is recommended to try the WK2801 protocol 1st when working with older Walkera models before attempting the WK2601 or WK2401 mode, as the WK2801 is a superior protocol. The WK2601 protocol supports up to 7 channels, and only supports auto-binding. The fixed ID can be used, but does not prevent auto-binding during power-on.

The WK2601 protocol also supports additional options. These are accessed by pressing the Protocol spin-box when Wk2601 is shown:
Chan mode: Sets how channels are processed:

- 5+1: AIL, ELE, THR, RUD, GYRO (ch 7) are proportional. Gear (ch 5) is binary. Ch 6 is disabled
- Heli: AIL, ELE, THR, RUD, GYRO are proportional. Gear (ch 5) is binary. COL (ch 6) is linked to Thr. If Ch6 >= 0, the Rx will apply a 3D curve to the Thr. If Ch6 < 0, the Rx will apply normal curves to the Thr. The value of Ch6 defines the ratio of COL to THR.

- 6+1: AIL, ELE, THR, RUD, COL (ch 6), GYRO (ch 7) are proportional. Gear (ch 5) is binary. This mode is highly experimental.

COL Inv: Invert COL servo
COL Limit: Set maximum range of COL servo

Protocol: WK2401

The WK2401 protocol is used to control older Walkera models. The previous Walkera models were segmented into 3 similar but not identical protocols: WK2801, WK2601, WK2401. This roughly corresponds to the number of channels supported, but many of the newer 6-channel receivers actually support the WK2801 protocol. It is recommended to try the WK2801 protocol 1st when working with older Walkera models before attempting the WK2601 or WK2401 mode, as the WK2801 is a superior protocol. The WK2401 protocol supports up to 4 channels, and only supports auto-binding. The fixed ID can be used, but does not prevent auto-binding during power-on.

Protocol: DSM2

The DSM2 protocol is used to control many Spektrum™ and JR™, as well as other models using this protocol. While the DSM2 protocol can support up to 14 channels, Deviation is currently limited to a maximum of 12. Note that many receivers with less than 8 channels require the Transmitter to send 7 or less channels. **Make sure the # of channels is set appropriately for the receiver**. DSM2 does not support auto-binding. If FixedID is set to None, a transmitter-specific ID is used instead. It is necessary to manually bind each model before the first use.
The DSM2 protocol also supports enabling/disabling the telemetry capability. This option is accessed by pressing the Protocol spin-box when DSM2 is shown.

Protocol: DSMX

The DSMX protocol is used to control many Spektrum™ and JR™, as well as other models using this protocol. While the DSMX protocol can support up to 14 channels, Deviation is currently limited to a maximum of 12. Note that many receivers with less than 8 channels require the Transmitter to send 7 or less channels. **Make sure the # of channels is set appropriately for the receiver**. DSMX does not support auto-binding. If FixedID is set to None, a transmitter-specific ID is used instead. It is necessary to manually bind each model before the first use.

Note that unlike Spektrum™ or JR™ transmitters, Deviation will not automatically select between DSM2 and DSMX. The user must select which protocol to use.

The DSMX protocol also supports enabling/disabling the telemetry capability. This option is accessed by pressing the Protocol spin-box when DSMX is shown.

Protocol: J6Pro

The J6Pro protocol is used to support Nine Eagles™ models. Only models compatible with the J6Pro transmitter can be used. Many older 4-channel Nine Eagles models used a different protocol that is unsupported. The J6Pro protocol supports up to 12 channels, although only models with 6 channels have been tested. J6Pro does not support auto-

binding. If FixedID is set to None, a transmitter-specific ID is used instead. It is necessary to manually bind each model before the first use.

Protocol: Flysky

The Flysky protocol is used to control Turnigy/Flysky receivers as well as a few other models using the same protocol (WL V911, Xieda 9958, etc). NOTE: This protocol requires the addition of an 'A7105' hardware module to function. See the following document for more information:
http://www.deviationtx.com/repository/Documentation/ModuleInstallation.pdf/

The Flysky protocol supports up to 8 channels, and both auto-binding and manual-binding. If FixedID is set to 'None' the transmitter will attempt to auto-bind with the receiver every time it is powered on. If a value is set for FixedID, the receiver must be bound manually one-time using the 'Bind' button, after which it should stay bound.

The Flysky protocol also supports additional options. These are accessed by pressing the Protocol spin-box when Flysky is shown:

WLToys V9x9: Enables enhanced protocol configuration for use with WLToys V959, v969, etc models:

- Lights are controlled by Channel 5
- Video is controlled by Channel 6
- Camera is controlled by Channel 7

Note that if these channels are assigned to a switch, turning the switch on toggles the state, and turning the switch off has no effect. Thus to turn the lights on, flip the switch assigned to Channel 5 from off to on. Flipping the switch back to off has no effect. Flipping the switch back on now turns the lights back off.

Protocol: Hubsan4

The Hubsan4 protocol supports the Hubsan-X4 quadracopter. No other models have been tested with this protocol. NOTE: This protocol requires the addition of an 'A7105' hardware module to function. See the following document for more information:
http://www.deviationtx.com/repository/Documentation/ModuleInstallation.pdf/

The Hubsan4 protocol supports 4 channels, and only supports auto-binding. The fixed ID can be used, but does not prevent auto-binding during power-on.

Protocol: Frsky1 (Not Yet Released)

The Frsky1 protocol is used to control older (non-telemetry) Frsky™ receivers using the one-way protocol.
NOTE: This protocol requires the addition of a 'CC2500' hardware module to function. See the following document for more information:
http://www.deviationtx.com/repository/Documentation/ModuleInstallation.pdf/

The Frsky1way protocol supports 4 channels, does not support auto-binding. If FixedID is set to None, a transmitter-specific ID is used instead. It is necessary to manually bind each model before the first use.

Protocol: Frsky2 (Not Yet Released)

The Frsky2 protocol is used to control newer (telemetry enabled) Frsky™ receivers using the two-way protocol.
NOTE: This protocol requires the addition of a 'CC2500' hardware module to function. See the following document for more information:
http://www.deviationtx.com/repository/Documentation/ModuleInstallation.pdf/

The Frsky2way protocol supports up to 8 channels, does not support auto-binding. If FixedID is set to None, a transmitter-specific ID is used instead. It is necessary to manually bind each model before the first use.

The Frsky2way protocol also supports enabling/disabling the telemetry capability. This option is accessed by pressing the Protocol spin-box when Frsky2way is shown.

Protocol: Skyartec (experimental)

The Skyartec protocol is used to control Skyartec™ receivers and models.
NOTE: This protocol requires the addition of a 'CC2500' hardware module to function. See the following document for more information:
http://www.deviationtx.com/repository/Documentation/ModuleInstallation.pdf/

The Skyartec protocol supports up to 7 channels, does not support auto-binding. If FixedID is set to None, a transmitter-specific ID is used instead. It is necessary to manually bind each model before the first use.

Protocol: PPM

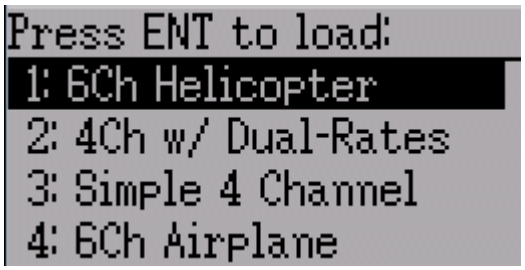
The PPM protocol is used to output PPM on the trainer port. It will disable all radio transmission. The PPM protocol is useful for connecting to simulators, or other radio-modules that plug into the trainer port. The FixedID has no effect, and there is no binding associated with this protocol.

Deviation does not auto-detect when a trainer cord is plugged into the transmitter. To use Deviation with a simulator (such as Phoenix), create a new model, name it appropriately, and select PPM as the protocol. Use the Re-Init button or power-cycle to enable PPM mode.

The Flysky protocol also supports additional options. These are accessed by pressing the Protocol spin-box when Flysky is shown:

- **Center PW**: defines the pulse-width when sticks are centered
- **Delta PW**: defines the change in pulse-width when channel value is +/-100%
- **Notch PW**: defines the delay between channels
- **Frame Size**: defines the total time for all channels to be transferred

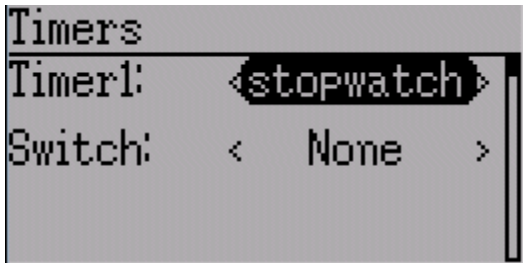
Predefined Templates



The Deviation firmware supports user-customizable predefined templates. By Selecting 'Template...' From the Model page, it is possible to select one of these options

Additional templates can be added via USB to the '\template' directory.
A template does not completely replace your existing model, but instead only a portion of it. The currently supported templates will replace the mixer and trim definitions, but will not affect the display layout. In the future Deviation will support templates that only affect the display layout without affecting the mixers as well.

Timer Page (Standard & Advanced GUI)

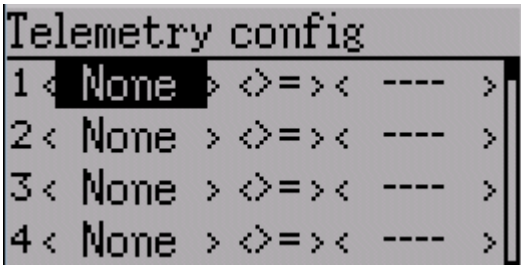


The timer page defines up to 4 available timers. Timers can count either up or down, and can be enabled either manually from the main screen or by an input trigger (stick or switch).

Timers can also be optionally configured to be reset via an alternate switch (only when using the Advanced GUI).

The 'permanent' timers have their values saved in the model.ini file and will maintain their previous value when powering up the transmitter.

Telemetry Configuration Page (Standard & Advanced GUI)



The telemetry configuration page allows specifying alarms when specific telemetry events occur. This page is accessed from the main menu via 'Model menu' followed by 'Telemetry'

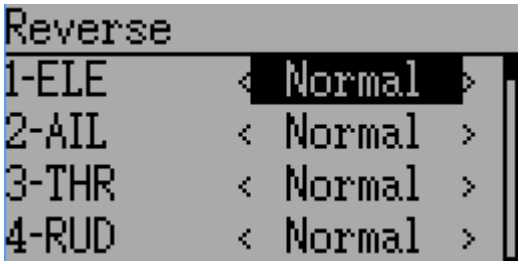
Telemetry: Specify the telemetry input to use for alarm control. This can be a temperature probe, voltage probe, or RPM probe.
Equality: Can be '>=' or '<=' indicating whether a value above or below the target causes an alarm.
Target: The target value for the alarm

Standard GUI

The Standard GUI is an alternative interface from the Advanced GUI'. Which interface is used is chosen by the 'Mixer GUI' on the Model Page. The Standard GUI is only available for Helicopter-type models at this time. The pages of the Standard GUI are as follows:

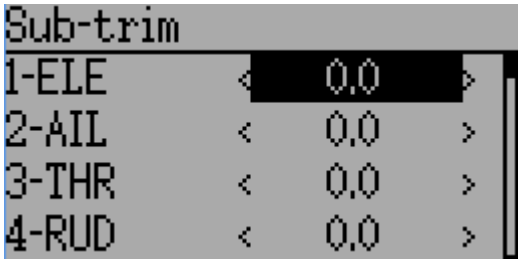
1. **Model setup**: Model configuration page (See page 18)
2. **Reverse**: Servo reverse (See page 24)
3. **D/R & Exp**: Dual-rates setup (See page 25)
4. **Subtrim**: Servo sub-trim (See page 24)
5. **Travel adjust**: Servo travel-adjust (See page 25)
6. **Throttle curves**: Throttle curve setup (See page 25)
7. **Pitch curves**: Pitch curve setup (See page 26)
8. **Throttle hold**: Throttle-hold configuration (See page 26)
9. **Gyro sense**: Gyro-sense configuration (See page 26)
10. **Swash**: Swash Setup (See page 25)
11. **Fail safe**: Fail-Safe configuration (See page 26)
12. **Switch assignment**: Assign switch controls (See page 26)
13. **Timers**: Timer configuration (See page 23)
14. **Telemetry config**: Configure telemetry alarms (See page 23)
15. **Main page config**: Configure main page display (See page 12)

Servo Reverse (Standard GUI)



The servo reverse page allows quickly setting each channel to work in either normal or reversed mode. These settings are equivalent to the 'Reverse' setting on the Channel Configuration sub-page of the Mixer menu when using the Advanced Mixer (see page 17)

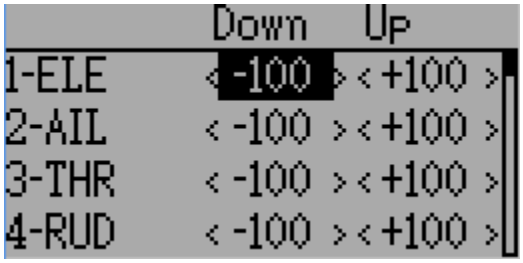
Sub-trim Adjustment (Standard GUI)



The sub-trim adjust page allows setting the zero-point of the servos for each channel. This is equivalent to the 'Subtrim' setting on the Channel Configuration sub-page of the Mixer menu when using the Advanced Mixer (see page 17)

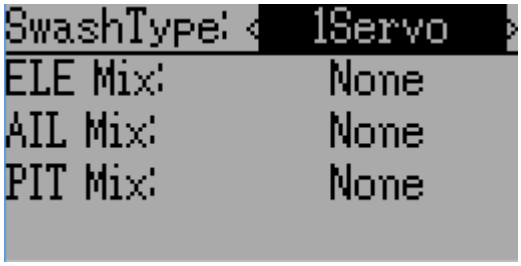
Servo Travel Adjust (Standard GUI)

The servo-travel adjust page configures the maximum positive/negative travel of each servo. This is equivalent to the 'Scale+' and 'Scale-' settings on the Channel Configuration sub-page of the Mixer menu when using the Advanced Mixer (see page 17)



Swash Configuration (Standard GUI)

The Swash configuration page configures the swash type. These settings are equivalent to the settings on the 'Helicopter' configuration sub-page of the Model page (see page 18).

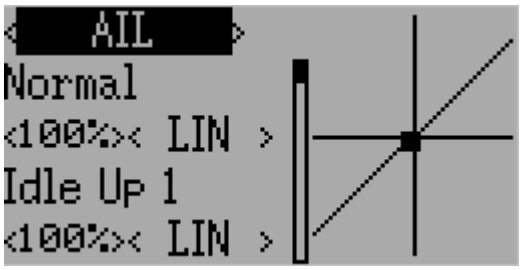


The available values are:

- **1Servo**: Used For FBL. All mixing occurs in Rx
- **3Servo 120**: 120-degree swash
- **3Servo 120x**: 120 degrees swash (alternate config)
- **3Servo 140**: 140 degree swash
- **3Servo 90**: 90 degrees swash

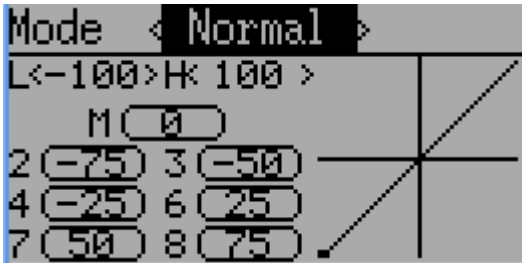
Dual-Rate/Expo setting (Standard GUI)

The dual-rate and expo page allows configuration of curves for the Aileron, Rudder, and Elevator channels. Up-to 3 rates can be configured for each channel, and either a scaled-linear or exponential curve can be selected for each. The number of settings depends on the switch assigned to the dual-rates function on the Switch Assignment page (see page 26)



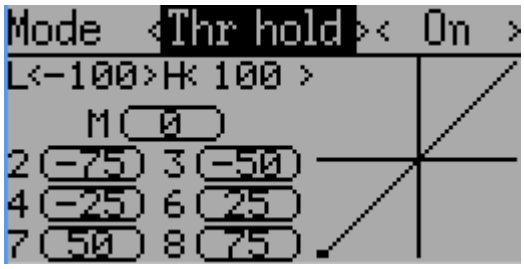
Throttle Curve (Standard GUI)

The throttle curve page allows defining a piece-wise linear curve for the throttle channel. Different curves can be selected for each flight-mode. Each point value can be enabled to be interpolated from the points surrounding it.



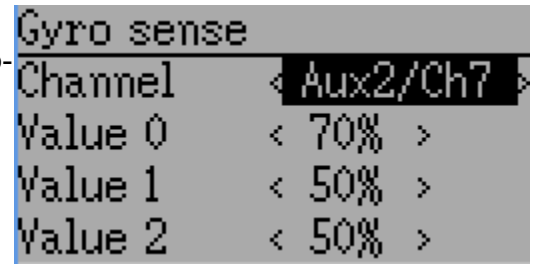
Pitch Curve (Standard GUI)

The pitch curve allows defining a piece-wise linear curve for the collective/pitch channel. Different curves can be selected for each flight-mode as well as for throttle-hold. Each point value can be enabled to be interpolated from the points surrounding it.



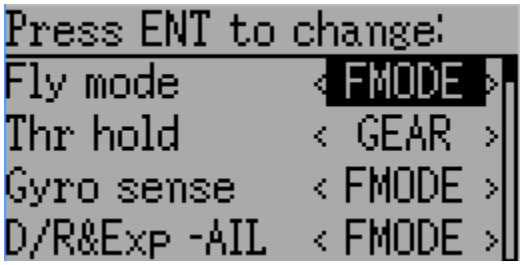
Gyro Sensitivity (Standard GUI)

The gyro-sensitivity page enables configuring up-to 3 sensitivity values for the gyro as well as which channel to use for sending the gyro value.



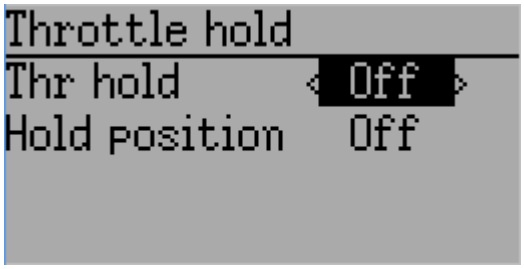
Switch Assignment (Standard GUI)

The switch assignment page enables configuring which switches to use for each capability in the standard-GUI. The same switch may be assigned to multiple capabilities.



Throttle Hold (Standard GUI)

The throttle-hold page is used to enable/disable the throttle-hold capability. Specifying 'Hold position' defines the throttle value when the Throttle-hold switch is set.



Fail-Safe Configuration (Standard GUI)

The fail-safe page is used to configure the fail-safe value for each channel (if the protocol supports this feature)